



Angiostrongylosis in Jamaica: 1994 – present

Ralph Robinson, John Lindo, Cecelia Waugh, Paul Brown and Cheridah Todd
Parasite Research Group
The University of the West Indies
Mona, Kingston
Jamaica

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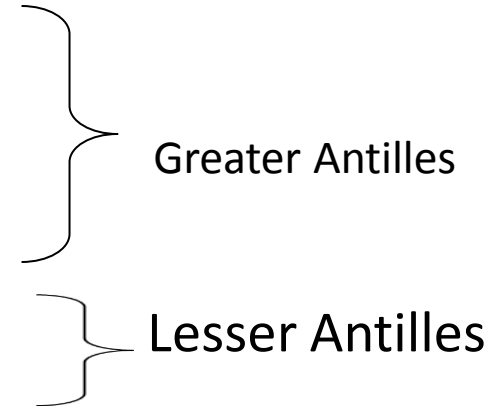


Land size: 145 x 50 miles; 4,243 sq miles
Population: ~2.7 M
National motto: “Out of many, one people”

Angiostrongylus in rats and humans in the Caribbean

- Rats

- Cuba (Aguair *et al.*, 1981)
- Puerto Rico (Anderson *et al.*, 1986)
- Dominican Republic (Vargas *et al.*, 1996)
- Haiti (Christian *et al.*, 2003)
- Grenada (Chikweto *et al.*, 2009)
- Absent from Barbados? (Levette *et al.*, 2004)



- Non-human primates

- Bahamas (Gardiner, 1990)

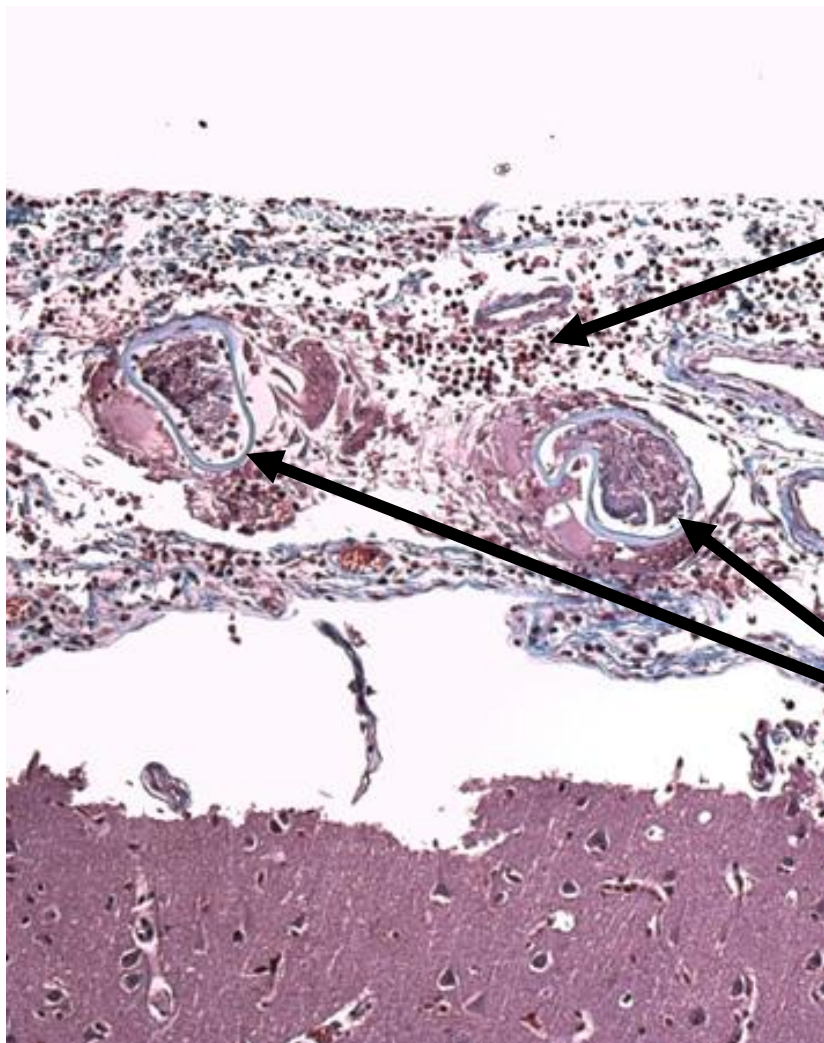
- Humans

- Cuba (Pascual, 1981)
- Jamaica (Barrow *et al.*, 1996)
- Martinique (DeMeuron, 2005)

Human angiostrongylosis in Jamaica

- ~25 human cases from 1994-present.
- 2 fatalities to date
 - 134 mo. Child
 - prisoner

Angiostrongylus larvae in the human brain (14 mo. male)



**Cellular infiltrate
lymphocytes;
neutrophils;
eosinophils**

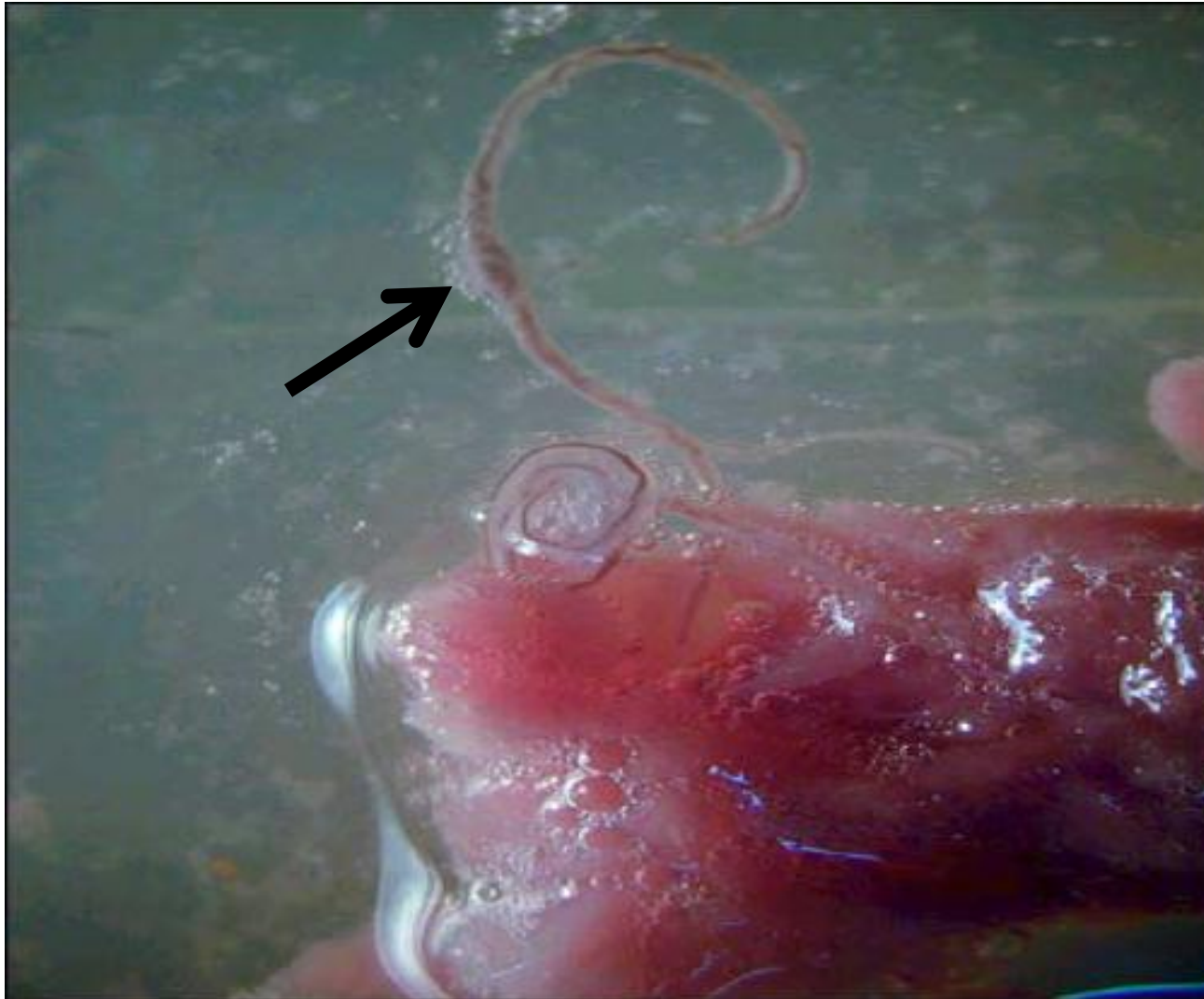
Angiostrongylus

Rat collections in Jamaica

- The procedure involved the trapping and recovery of adult *A. cantonensis* from the heart and pulmonary arteries of rats collected from the thirteen parishes of the island
- 437 wild rats were autopsied:
 - 297 *Rattus rattus*
(Black rats)
 - 140 *R. norvegicus*
(Brown rats)



Angiostrongylus recovered from cardio-pulmonary system of wild rat in Jamaica



Prevalence and intensity of infection with
Angiostrongylus in *R. rattus*, and
R. norvegicus in Jamaica

Species	Prevalence	Mean Intensity
<i>R. rattus</i> (Black rats)	35.4% (n=297) P < 0.04	16.8 worms P < 0.05
<i>R. norvegicus</i> (Brown rats)	25.7% (n=140)	11.3 worms

Molluscan potential intermediate hosts for *Angiostrongylus* in Jamaica

- Jamaica is “Snail Heaven”
 - 555 named species of terrestrial molluscs in Jamaica (Rosenberg & Muratov, 2005)
 - 499 are endemic to Jamaica, that is, found nowhere else in the world
- No Giant African Land Snails – **YET!**
-yet *Angiostrongylus* is alive and well in rats in Jamaica!

So far, we have surveyed 16 species of terrestrial snails (n = 777), and 2 species of slugs (n = 46) from *Angiostrongylus* “hot spots” in Jamaica

Snail collections

- The foot of each snail was excised and minced in preparation for digestion with 0.01% pepsin / 0.07% HCl (v/v)
- Tissues were incubated in the digestion fluid for periods of 12 - 24 hours after which they were examined individually for parasitic larval stages



Terrestrial mollusc hosts for *Angiostrongylus* in Jamaica (for 16 species)

SNAILS	Number collected	% Prevalence <i>Angiostrongylus</i>	Comment
<i>Pleurodonte (= amabilis?)</i>	86	29.1	NHR
<i>Thelidomus aspera</i>	369	18.7	NHR
<i>Sagda</i> sp.	18	11.1	NNR
<i>Poteria</i> sp.	5	20.0	NHR
SLUGS			
Veronicellidae (= <i>Veronicella sloanei?</i>)	34	5.9	

'Unusual' suspects?



Thelidomus



Sagda



Veronicellid slug



Pleurodonte



Poteria

Photos: Ruiz Berti and Eladio Fernandez

Preliminary Molecular Investigations

- Species-specific Polymerase Chain Reaction (PCR) with Single-Stranded Conformation Polymorphism (SSCP) analysis
- CT1 and CT2 primers (18s rRNA gene) amplified 29/54 worms (stored in 95% ethanol); produced a band size = 268 bit pairs
- SSCP analysis of the PCR amplicons (n=29) produced similar banding patterns on ethidium bromide-stained polyacrylamide gels
- Similarity of *Angiostrongylus* populations?
- Application to diagnostics?

Transmission of *Angiostrongylus* in Jamaica?

– Contaminated vegetables?

- Infected snails observed to release larvae in lab.



– Ingestion of raw infected molluscs (snails, slugs)?

– Ingestion of raw infected paratenic hosts e.g. crustaceans (freshwater 'janga' shrimp)?

Preliminary 'Knowledge, Attitudes, and Practices' (KAP) study (Waugh et al, 2005)

Group \ Risk	Ingestion of raw molluscs	Ingestion of raw crustaceans
University Students (107; 66% female)	18% ate raw mussels +29% males would do it as a 'dare' or for money!	1 female ate raw shrimp
Market venders (n=132; farmers; fishers)	35% fishers ate raw oysters	5% fishers ate raw shrimp (bait at sea)
Market patrons (n = 100; 595 female))	33% ate raw oysters	None ate raw shrimp

Overall: 94% (n = 339) ate raw vegetables – Good!

26% did not wash them before consumption – Bad!

Principal findings:

- *R. rattus* (Black rat) is the major reservoir of infection:
 - More common
 - Higher prevalence
 - Higher worm load
- *R. norvegicus* also important
- Four species of snails represent new host records for *Angiostrongylus*
- Preliminary SSCP data support PCR diagnoses; suggest homogeneity of *Angiostrongylus* populations
- Human eosinophilic meningitis is serologically and histopathologically linked to *Angiostrongylus*
- Local transmission of the parasite to humans is occurring most likely through chance **ingestion of unwashed contaminated vegetables**, or infected molluscs
- Role of paratenic (e.g. crustacean) hosts is unclear